The estimation of groundwater recharge is a fundamental component of any water resources appraisal or aquifer vulnerability study. Although methods for evaluating the distribution of potential recharge leaving the soil zone are relatively well developed,the recharge signal to the underlying aquifer can be significantly modified in the presence of superficial drift deposits. Current mapping of the drift does not often provide representations of drift distribution and structure suitable for understanding the hydraulics of the subsurface flow system. The current research seeks to develop new understanding of the processes contributing to recharge in heterogeneous drift sequences, their characterisation in models and their parameterisation through field experiments. Surface and downhole geophysical sampling through regional to micro scales will be integrated with textural measurements and hydraulic monitoring to characterise drift deposits in parts of the Tern catchment (Shropshire, UK) and gain insight into the relationship between flow behaviour and geological structure. Fieldwork will then culminate in a series of flow and tracer tests at a well characterised site with continuous monitoring including the use of recently developed 4-D resistivity imaging methods to monitor the movement of natural and applied waters through the drift.Conceptual and numerical models will be used throughout the project to test ideas and drive the experimental designs. The study aims to assess the relative importance of hydraulic processes at a range of scales and, by back analysis, the degree of sophistication required in fieldwork to construct a useful model of flow patterns within the drift. The potential usefulness of various surface and downhole geophysical techniques within drift and unsaturated zone studies will be critically assessed.